



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,184	02/12/2004	Takao Ohno	Q79839	3094

23373 7590 02/23/2007
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

VO, HAI

ART UNIT	PAPER NUMBER
----------	--------------

1771

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/776,184

Applicant(s)

OHNO ET AL.

Examiner

Hai Vo

Art Unit

1771

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-35 is/are pending in the application.
- 4a) Of the above claim(s) 8-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-7, and 33-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

1. The art rejections based on Daido have been maintained.
2. Rejection of claim 7 based on Shinohara, Cieslak and Tsutsumi has been withdrawn in view of Applicants' arguments. Shinohara teaches when the ceramic powder having a particle size over 1 micron, the separator becomes fragile and handling becomes difficult. Therefore, using an inorganic whisker having a fiber length from 5 to 50 microns as taught by Tsutsumi would defeat the objective of Shinohara, namely decreasing strength of the separator and causing handling difficult. However, rejections of other claims based on Shinohara are maintained.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 3, 4, 33 and 34 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Daido et al (US 6,291,106). Daido teaches a porous film made from a polymetaphenylene isophthalate has a gas permeability of 20 sec/100 cc.in² or less and a thickness of 50 microns or less (column 7, lines 1-5). According to Applicant's calculation, the porous film of the present invention has a gas permeability of 0.1-500 sec/100 cc.in² which is equivalent to 0.2 –1000 ml/sec as set out in the claims (page 2 of the 10/05/2006 amendment). Likewise, the Daido porous film has the gas permeability overlapping with the claimed range. The porous film has a porosity of 62% and a density of 0.53 g/cm³ (example 1). The porous film is suitable as a battery separator (column 4, lines 25-30). Daido does not specifically disclose the cross-sectional pore laminar coefficient, specific Young Modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min. However, since the porous film of Daido is made of the same material as that of the present invention and has a thickness, porosity, density and gas permeability within the claimed ranges, it is not seen that the porous resin film of Daido would have performed differently than that of the present invention in terms of the cross-sectional pore laminar coefficient, specific Young Modulus and percent of gas permeability retained after heat treatment at 350°C for 10 mins so as to efficiently function as a battery separator. Accordingly, Daido anticipates or strongly suggests the claimed subject matter.

6. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daido et al (US 6,291,106) in view of Shinohara et al (US 6,447,958). Daido does not specifically disclose the porous film containing inorganic whiskers.

Shinohara, however, discloses a porous film as a battery separator comprising a heat resistant polymer and a ceramic powder wherein the heat resistant polymer includes both meta-oriented aromatic polyamide and para-oriented aromatic polyamide (column 3, lines 40-55). Shinohara discloses the ceramic powder present in the amount of 5 to 100 parts by weight per 100 parts by weight of a heat-resistant polymer (column 8, lines 1-3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add ceramic powder in the film composition motivated by the desire to impart mechanical strength and dimensional stability of the film.

7. Claims 5-7 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daido et al (US 6,291,106) in view of Tsutsumi et al (US 5,571,875). Daido does not specifically disclose the porous film containing inorganic whiskers.

Tsutsumi teaches a polyimide based resin composition that is excellent in processibility and has improved mechanical characteristics, heat resistance and chemical resistance (column 3, lines 5-10). Tsutsumi teaches a resin composition comprising a polyimide resin, a polymetaphenylene isophthalamide and inorganic whiskers having a fiber length L from 5 to 50 microns and a fiber diameter D from 0.05 to 1 microns within the claimed range (column 20, lines 30-50 and column 22, lines 30-33). The whiskers are present in an amount ranging

from 5 to 100 wt% based on the weight of the resin composition (column 22, lines 43-45). Such a dimension would have been recognized by one skilled in the art to impart the mechanical strength and dimensional stability while maintaining an ease of the film processing. As such, in the absence of unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the ceramic powder having the L/D ratio as taught by Tsutsumi motivated by the desire to impart mechanical strength and dimensional stability while maintaining an ease of the film processing.

8. Claims 1, 3-6, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohara et al (US 6,447,958) in view of Cieslak et al (US 5,002,843). Shinohara discloses a porous film as a battery separator comprising a heat resistant polymer and a ceramic powder wherein the heat resistant polymer includes both meta-oriented aromatic polyamide and para-oriented aromatic polyamide (column 3, lines 40-55). Shinohara discloses the porous film having a porosity greater than 50% and a thickness of 5 to 30 microns or less (column 5, lines 65-67 and column 10, lines 20-22). Shinohara disclose the porous film having an air permeability of 680 cc/sec (column 18, lines 8-10). Shinohara discloses the ceramic powder present in the amount of 5 to 100 parts by weight per 100 parts by weight of a heat-resistant polymer (column 8, lines 1-3). Shinohara discloses the para-oriented aromatic polyamide is preferable because it tends to become porous (column 3, lines 55-56). However, there is no suggestion that the meta-oriented aromatic polyamide is excluded from the

porous film. Shinohara does not disclose that polymetaphenylene isophthalamide is the meta-oriented aromatic polyamide. Cieslak, however, discloses a battery separator made from polyparaphenylene terephthalamide and polymetaphenylene isophthalamide (column 3, lines 35-37). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use polymetaphenylene isophthalamide because such is intended use of the material and Cieslak provides necessary details to practice the invention of Shinohara.

Shinohara does not specifically disclose a cross-sectional pore laminar coefficient, specific Young's modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min. However, it appears that the porous film as modified by Shinohara has the gas permeability, porosity, thickness within the claimed ranges. The resulting porous film is made from a composition similar to that of the present invention, i.e., the weight ratio of the heat resistant polymer to the whisker. Therefore, it is not seen that the resulting porous film would have performed differently than the porous film of the present invention in terms of the cross-sectional pore laminar coefficient, specific Young's modulus and percent of gas permeability retained after heat treatment at 350°C for 10 min so as to be suitable as the battery separator.

Response to Arguments

9. The art rejections over Daido have been maintained for the following reasons.

Applicants argue that the product of Daido is not a porous film, but rather a non-

woven fabric sheet which is made into a film-like form by being coated with a polymer. The examiner respectfully disagrees. Daido teaches the porous reinforcing material is a thin film having a three-dimensional network (column 7, lines 60-65). Further, nothing in the claims has excluded a porous film comprising filaments made from a polymetaphenylene isophthalamide polymer. Therefore, the porous reinforcing material of Daido thus reads on the porous film of the claimed invention.

Applicants argue that a gas permeability of the Daido sheet is different from the gas permeability as recited by the claims. The arguments are not found persuasive because they are not commensurate in scope with the claims. Daido teaches a porous film having a gas permeability of 20 sec/100 cc.in² or less (column 7, lines 1-5). According to Applicant's calculation, the porous film of the present invention has a gas permeability of 0.1- 500 sec/100 cc.in² which is equivalent to 0.2 –1000 ml/sec as set out in the claims (page 2 of the 10/05/2006 amendment). Likewise, the Daido porous film has the gas permeability overlapping with the claimed range.

Applicants argue that the porous film of Daido could not achieve a cross-sectional pore laminar coefficient as set forth in the claims based on the size of the fibers and the film thickness as shown in example 1. The examiner respectfully disagrees. Note that the film of Daido could have a thickness up to 100 microns (column 7, line 1). Likewise, it would have at least three pores existing between the fibers in the thickness direction. Accordingly, the Daido

porous film would have the cross-sectional pore laminar coefficient within the claimed range in light of Applicants' technical analysis.

10. The art rejections based on Shinohara have been maintained for the following reasons. Applicants argue that the battery separator of Shinohara is not porous when the content of the powder is less than 1 wt%. It appears that Shinohara uses the powder with a content of 1 wt% or more, Shinohara's film is thus porous. It sounds like Applicants seem to agree that no significant difference is found between the claimed porous film and the Shinohara film.

Applicants argue that the shapes of the fillers are different between Shinohara and the present invention. However, nothing specific about that difference is incorporated in the claims. Applicants have reiterated positions taken with respect to the other rejections, the examiner's comments set forth above are equally pertinent in the support of these rejections as well.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai Vo whose telephone number is (571) 272-1485. The examiner can normally be reached on Monday through Thursday, from 9:00 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1771

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HV



HAI VO
PRIMARY EXAMINER